

Amendments to the Drawings:

The attached sheet of drawings includes changes to Figure 16. This sheet, which includes Figure 16, replaces the original sheet including Figure 16.

Attachment: Replacement Sheet

REMARKS

Reconsideration of the present application is respectfully requested in view of the above amendments and the following remarks. Without acquiescence to the rejection, claims 16-18 are amended to more particularly point out and distinctly claim certain embodiments of Applicants' invention. No new matter has been added by the amendments, which merely clarify that claims 16-18 depend from claim 5.

DRAWINGS

The Examiner objects to the drawings, asserting that Figure 16 appears to be unacceptable for publication.

Applicants submit herewith a replacement sheet for Figure 16, which Applicants believe to be acceptable for publication. Thus, Applicants respectfully request withdrawal of this objection.

REJECTIONS UNDER 35 U.S.C. § 112, SECOND PARAGRAPH, INDEFINITENESS

The Examiner rejects claims 16-18 under 35 U.S.C. § 112, second paragraph, for alleged indefiniteness. The Examiner asserts that there is no antecedent basis for the recitation "further comprises," since the instant claims do not recite any dependency to any other claim.

Applicants traverse this rejection and submit that the instant claims satisfy the requirements of definiteness. Notwithstanding the rejection, claims 16-18 as amended recite "[t]he genetically modified *Saccharum* sp cell of claim 5 which further comprises," which Applicants believe to obviate this rejection.

Applicants submit that the instant claims satisfy the requirements of definiteness under 35 U.S.C. § 112, second paragraph, and respectfully request withdrawal of this rejection.

REJECTIONS UNDER 35 U.S.C. § 102

The Examiner rejects claims 1-3, 5-7, and 9-13 under 35 U.S.C. § 102(b) for alleged lack of novelty over Asrar *et al.* (U.S. Patent No. 6,091,002). The Examiner asserts that Asrar *et al.* teach a method of making transformed plants that produce polyhydroxybutyrate

(PHB) using the PHB pathway from *R. eutropha* and *A. eutrophus*, and which utilize polynucleotide sequences that read on the instant SEQ ID NOS:1, 4, and 7, and those that hybridize to their complements under stringent conditions.

Applicants traverse this rejection and submit that the instant claims satisfy the requirements of novelty over Asrar *et al.* Embodiments of the present invention relate, in pertinent part, to methods for producing polyhydroxyalkanoates (PHAs) in a species of *Saccharum*, comprising expressing nucleotide sequences comprising SEQ ID NO:1, SEQ ID NO:4 and SEQ ID NO:7, or nucleotide sequences capable of hybridizing to the complement of SEQ ID NO:1, SEQ ID NO:4 or SEQ ID NO:7 under stringent conditions.

Applicants note that in order to anticipate the claims, the claimed subject matter must be disclosed in the reference with ‘*sufficient specificity*’ to constitute an anticipation under the statute. *See, e.g.*, M.P.E.P. § 2131.03 (*emphasis added*). It is not enough to disclose all the claim elements, rather “[t]he identical invention must be *arranged* as required by the claim...” *Id.* (without internal citations) (*emphasis added*). Here, Asrar *et al.* fail to disclose with *sufficient specificity* the recited *phA*, *phB*, and *phC* polynucleotide sequences from *Ralstonia eutropha* (SEQ ID NOS:1, 4 and 7), nor do they disclose the specific combination of these three recited sequences for producing PHAs in any plant, let alone sugarcane.

Applicants submit that Asrar *et al.* fail to disclose each and every feature of the instant claims. Specifically, Applicants respectfully disagree with the Examiner’s assertion (*see* page 3 of the Action) that claims 1-4 of Asrar *et al.* teach the use of *phA*, *phB*, and *phC* from *Ralstonia eutropha* (*i.e.*, SEQ ID NOS:1, 4, and 7) in sugarcane. To the contrary, absent further evidence by the Examiner, it is submitted that the mere generic mention of unidentified genes by their speculative enzymatic activities does not provide the required *specificity* under section 102 to anticipate the three specific species of *phA*, *phB*, and *phC* polynucleotide sequences from *Ralstonia eutropha*, and those that hybridize to the complements thereof under stringent conditions, as presently claimed. *See, e.g.*, M.P.E.P. § 2131.02, citing *Ex parte A*, 17 USPQ2d 1716 (Bd. Pat. App. & Inter. 1990) (One of ordinary skill in the art must be able to draw the structural formula or write the name of each of the compounds included in the generic formula before any of the compounds can be “at once envisaged.”). Here, the Examiner has provided no

evidence that a person skilled in the art can at once envisage or identify the specific polynucleotide sequences of SEQ ID NOS:1, 4, and 7 from the generic description in Asrar *et al.*

Further to this point, none of the polynucleotide or polypeptide sequences specifically described in Asrar *et al.* would have been expected to read on or hybridize to the complements of any of the individual sequences of SEQ ID NOS:1, 4, or 7, let alone all three of these sequences, as presently claimed. For instance, SEQ ID NO:11 of Asrar *et al.*, providing the polypeptide sequence of a β -ketothiolase gene from *A. eutrophus*, shares only limited sequence identity to the polypeptide encoded by the *phaA* gene of SEQ ID NO:1, as claimed (*see* Sequence Alignment submitted herewith). Although the burden of proof lies with the Examiner in this regard, according to Applicants' analysis, none of the other sequences of Asrar *et al.* share even remote sequence identity to the individual, recited polynucleotides of instant claim 1. Thus, none of the polynucleotide sequences described in Asrar *et al.* read on any of the individually recited *phaA*, *phaB*, and *phaC* polynucleotide sequences from *Ralstonia eutropha*, let alone do they read on all three of these recited sequences, nor would the sequences of Asrar *et al.* be expected to hybridize to their complements, as presently claimed.

Not only do Asrar *et al.* fail to disclose with any degree of specificity a single polynucleotide sequence that falls within the scope of the instant claims, this reference fails to “arrange” the particular combination of these three sequences (*i.e.*, *phaA*, *phaB*, and *phaC*) to produce PHAs in sugarcane, as recited in the claims. *See, e.g., See, e.g.*, M.P.E.P. § 2131.03, *supra*. Rather, it is respectfully submitted that the Examiner relies improperly on the generalized disclosure in Asrar *et al.* in asserting without adequate evidentiary support that this reference discloses the specifically claimed combination of all three of SEQ ID NOS:1, 4, and 7 in sugarcane, none of which are even individually or specifically disclosed in Asrar *et al.* In view of these deficiencies, Applicants submit that Asrar *et al.* fail to disclose each feature of the instant claims, and, thus, fail to anticipate the same.

Therefore, Applicants submit that the instant claims satisfy the requirements of novelty over the cited references, and respectfully request withdrawal of this rejection under 35 U.S.C. § 102(b).

REJECTIONS UNDER 35 U.S.C. § 103

The Examiner rejects claims 1-7 and 9-18 under 35 U.S.C. § 103(a) for alleged obviousness over Asrar *et al.* in view of Liebergesell *et al.* (U.S. Patent No. 6,475,734). The Examiner relies on Asrar *et al.* as detailed in the novelty rejection above, but agrees that this reference does not teach sugarcane plants that, in addition to SEQ ID NOS:1, 4, and 7, *further* comprise a polynucleotide of SEQ ID NOS:19, 28, or 31, or methods of use thereof. The Examiner, however, asserts that Liebergesell *et al.* teach plants, including sugarcane, which are engineered with polynucleotides of SEQ ID NOS:19, 28, or 31 to produce PHBs. The Examiner then asserts that it would have been obvious to further engineer the sugarcane of Asrar *et al.* to incorporate the polynucleotides sequences of Liebergesell *et al.*, since these sequences were known in the art and identified as being useful for genetically engineering plants to produce biopolymers.

Applicants traverse these rejections and submit that the instant claims satisfy the requirements of non-obviousness over the cited references. In particular, the key to establishing any rejection under 35 U.S.C. § 103 is a clear articulation of reasons why the claimed invention would have been obvious, which should be made explicit by the Examiner. *KSR v. Teleflex*, 550 U.S. at ___, 127 S.Ct. 1727, 1741 (2007), citing *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006) (“[R]ejections on obviousness cannot be sustained by mere *conclusory statements*; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.”) (emphasis added). Here, the Examiner has not shown that the cited references, in combination, teach or suggest each claim feature.

In addition, the Examiner has not adequately demonstrated by the required technical reasoning or evidence that the combination of references relied upon by the Examiner to arrive at the claimed invention would have been expected to yield nothing more than predictable results, based on the knowledge in the art at the time of filing, or, phrased differently, the Examiner has not established by the required technical reasoning that a person of ordinary skill in the art at the time of filing would have modified these references to achieve the claimed invention with a reasonable expectation of success. See, e.g., *PharmaStem Therapeutics, Inc. v. ViaCell, Inc.*, 491 F.3d 1342, 1360, 1363 (Fed. Cir. 2007).

For one, Applicants submit that the cited references, in combination, fail to teach or suggest each feature of the instant claims. As detailed in novelty rejection above, Asrar *et al.* fail to teach or suggest the specific *phA*, *phB*, and *phC* polynucleotide sequences from *Ralstonia eutropha* (i.e., SEQ ID NOS: 4, or 7), and those that hybridize to the complements thereof under stringent conditions, as presently claimed. Moreover, Asrar *et al.* in no way remotely suggest that these three specific polynucleotide sequences can be combined to facilitate production of PHAs in any plant, let alone a species of *Saccharum*. Liebergesell *et al.* do not remedy the defects in Asrar *et al.*, as this reference likewise fails to even remotely disclose a species of *Saccharum* that comprises any of SEQ ID NOS:1, 4, or 7, let alone the combination of these three sequences. Since the cited references, in combination, fail to teach or suggest each feature of the instant claims, these references fail to establish a *prima facie* case of obviousness over these claims.

Applicants also submit that the Examiner has not established by the required technical reasoning that a person skilled in the art at the time of invention would have had a reasonable expectation of success in genetically engineering sugarcane, or a species of *Saccharum*, as presently claimed. See *PharmaStem Therapeutics, Inc. v. ViaCell, Inc.*, 491 F.3d 1342, 1360, 1363 (Fed. Cir. 2007). For one, it is kindly submitted that a person skilled in the art at the time of invention could have had no reasonable expectation of success in utilizing a combination of specific polynucleotide sequences that cannot be found anywhere in the cited references. Thus, given the deficiencies in Asrar *et al.*, which do not teach or suggest the claimed polynucleotides of SEQ ID NOS:1, 4, and 7, let alone the combined use of these polynucleotides in sugarcane, even assuming, *arguendo*, that a person skilled in the art further engineered the sugarcane of Asrar *et al.* according to the teachings of Liebergesell *et al.*, as proposed by the Examiner, that person would not even achieve the presently claimed subject matter. Instead, such a person would have had to embark on a whole new line of experimentation to establish that the combined polynucleotides of SEQ ID NOS:1, 4, and 7 could be utilized to produce PHAs in sugarcane, and to further engineer that sugarcane to comprise one of SEQ ID NOS:19, 28, or 31. Thus, the Examiner has not established the requisite elements of a *prima facie* case of obviousness.

Also, Applicants respectfully disagree with the Examiner's unsupported, and, therefore, conclusory assertion that techniques for successfully transforming sugarcane with multiple genes were known (*see* the Action, page 5). In this regard, it is kindly emphasized that "rejections on obviousness cannot be sustained by mere *conclusory statements*; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness." *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006) (emphasis added). Moreover, the burden of proof in this regard lies with the Examiner, not Applicants. *See In re Mayne*, 104 F.3d 1339 (Fed. Cir. 1997) (The USPTO has the burden of showing a *prima facie* case of obviousness).

Here, even assuming, *arguendo*, that it was common place prior to the time of invention to transform *Arabidopsis* or tobacco and then cross the resultant transgenic lines, the Examiner has not established that it was similarly common place to transform sugarcane, especially with multiple (*i.e.*, at least four) different polynucleotide coding sequences. Indeed, it is respectfully submitted that a person skilled in the art at the time of invention would have expected transforming sugarcane with multiple genes to result in gene silencing. Since gene silencing may have been expected to be deleterious to the subsequent growth or vegetative propagation of the transformed sugarcane, and/or to the expression of the inserted transgenes, especially in view of the known difficulties in getting sugarcane to flower, produce viable pollen count, and produce viable seeds, it is reasonable to expect that prior to Applicants' disclosure, the modification proposed by the Examiner would have been considered to be unlikely to work at best, and inoperable at worst. Thus, in view of the Examiner's unsupported and conclusory assertions in this regard, Applicants submit that the Examiner has not established with the requisite technical reasoning and evidence that a person skilled in the art at the time of filing would have predicted or reasonably expected to successfully practice the presently claimed subject matter. Accordingly, the Examiner has not established the required elements of a *prima facie* case of obviousness.

Absent Applicants' own teachings and results, a person skilled in the art at the time of filing would not have predicted or reasonably expected from the cited references to be capable of successfully transforming a species of *Saccharum* with the specific polynucleotides of

SEQ ID NOS:1, 4, and 7, including those that hybridize to their complements under stringent conditions, in addition to at least one of the polynucleotides of SEQ ID NOS: 19, 28, or 31. Given the complete absence of SEQ ID NOS:1, 4, and 7 in the cited references, let alone the combination of these sequences for use in producing PHAs in sugarcane, Applicants can only believe that the Examiner relies on impermissible hindsight in asserting that the instant claims are obvious.

In view of the remarks and evidence provided herein, Applicants submit that the instant claims satisfy the requirements of non-obviousness over the cited references, and respectfully request withdrawal of this rejection under 35 U.S.C. § 103(a).

Applicants believe that all of the claims in the application are allowable. Favorable consideration and a Notice of Allowance are earnestly solicited.

The Director is authorized to charge any additional fees due by way of this Amendment, or credit any overpayment, to our Deposit Account No. 19-1090.

Respectfully submitted,
SEED Intellectual Property Law Group PLLC

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WTC:jto

Enclosures:
Sequence Alignment
Replacement sheet for Figure 16

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